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ABSTRACT

This study sought to test the validity of the claim that certain Swedish and corresponding English vowel phonemes are indistinguishable when presented in a test containing isolated minimally contrastive words. It also sought to find a hierarchy of perceptual differences between Swedish and English phonemes. A series of 40 pairs of monosyllabic Swedish and English words was constructed. The Swedish words were recorded by 6 Swedish models, the English words by 5 English models. Two versions of the test were constructed, each one consisting of a tape containing 6-7 words from each informant. The test was administered to various groups of English-speaking and Swedish-speaking schoolchildren and university students. Subjects were asked to identify the pronunciations as native, foreign, or doubtful. "Native" was English for the English-speaking group and Swedish for the Swedish-speaking group. In general, both English and Swedish groups were able to distinguish between a "native" and a "foreign" pronunciation, although this varied according to linguistic background. The results contribute to a better description of the relationship between Swedish and English phonemes, and furnish information needed in establishing a hierarchy of importance in the teaching and testing of English pronunciation in Sweden. (AM)

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DEPARTMENT OF ENGLISH

LUND UNIVERSITY

SWEDISH – ENGLISH CONTRASTIVE STUDIES

Report No 5

Swedish and English Phonemes: A Perceptual Study

by

Stig Johansson

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Swedish-English Contrastive Studies

Swedish and English Phonemes:
A Perceptual Study

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Report No 5 1973

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1 AIM

This study was provoked by a report at the last AILA conference (Hök 1972), where it was maintained that certain Swedish and corresponding English vowel phonemes are indistinguishable when presented in a test containing isolated, minimally contrastive words, e.g. S[wedish] bin /bi:n/ and E[nglish] been /bi:n/. The aim of this study is to test the validity of this claim and, if possible, find a hierarchy of perceptual differences between Swedish and English phonemes (consonants as well as vowels). The outcome will furnish part of the evidence needed in order to establish a hierarchy of importance in the teaching and testing of English pronunciation in Sweden.

2 METHOD

A series of 40 pairs of Swedish and English words (in three cases sequences of three words) was constructed. A complete list of the words, with a phonetic transcription, is given in Appendix I. Principles of construction:

a) In order to eliminate effects of stress and word tone, all words included are monosyllabic.

b) In pairs 1-20 Swedish and English vowels are contrasted in frames of consonants which are usually said to be perceptually and/or articulatorily identical in Swedish and English: /b, p, k, g, f, s, h, m, n, ŋ/. Cf. Malmberg (1966) and Stubelius (1968).

c) In pairs 21-36 Swedish and English consonants are contrasted in frames consisting of one of the consonants listed under b) above and a vowel, usually S/ɛ/ and E/e/, which are said to be perceptually and/or articulatorily very close. Cf. Malmberg (1966), p. 30, and Stubelius (1968), p. 24.

d) The words in pairs 37-38 contain sequences of vowel + consonant which were tested individually in other pairs in the test.

e) Pairs 39-40 contain sequences of three words included in other pairs in the test.

Six Swedish and six English model speakers were selected. Four of the Swedes, two men and two women, were speakers of southern standard Swedish ("sydsvenskt rikksspråk"); the others, one man and one woman, were speakers of central standard Swedish ("mellansvenskt rikksspråk). The English models, three men and three women, were speakers of Received Pronunciation (RP) or a slightly modified version of RP.

The Swedish words were recorded by the Swedish models, the English words by the English models. The speakers were instructed to read the words with a falling intonation and with a pause of 2-4 seconds between them.[1] The test tape was prepared by selecting one recording of each Swedish and English word. Principles of selection:

a) 6-7 words were chosen from each speaker.

b) As far as possible, groups of words which would be interesting to compare were chosen from the same speaker, e.g.

S mej, maj, boj
E wreck, beck
S chock, tjock
E ten, net
S tenn, nätt, närt
E saw, sauce, who, hoop

c) Recordings were chosen from the same speaker in the case of E shock, wreck and gnat, which occur in more than one pair in the test.

The words selected were separated by a pause of 5 seconds, and a longer pause was inserted after each 20th word. The order between the words was random, with the following exceptions:

a) Care was taken not to place two words pronounced by the same speaker in immediate succession. Similarly, words of a Swedish-English pair were never placed in immediate succession.

b) In the case of E shock, wreck and gnat, which occur in more than one pair, the different recordings were separated as much as possible.

The test version constructed in this way will be termed Test I. A second version, Test II, was constructed in order to reduce the influence of individual model speakers on the results of the test. The recordings selected were pronounced by different speakers than in Test I. The order of the words was the same in both test versions.

Appendix II contains a complete list of the words in the test and information as to the identity of the speaker in the two test versions.

Tests I and II were administered to groups of schoolchildren at Grey Coat Hospital, London. Test subjects, 88 in all, were female and ranged in age from 13 to 18. The majority were 13 to 15 years old. They had, with few exceptions, spent all their lives in the London area. None of them knew Swedish or had visited Sweden or had associated with Swedes in England. A tape of the test was played in a classroom. Answer sheets were distributed containing only English words; Swedish test words were represented in written form on the answer sheet by the corresponding English test words. Subjects were instructed that they would hear a series of words pronounced by different native and foreign speakers of English and were asked to state in each case whether the speaker was a foreigner or a native speaker of English using the following scale:

E = native speaker of English
F = foreigner
? = doubtful

Between Tests I and II they were also asked to fill in a questionnaire designed to gather information about their age, place of residence, education etc.

The two test versions were administered to two additional groups of test subjects:

a) 25 students at Edinburgh University, aged 18-23 and all speakers of Scottish English. None of them had studied phonetics. None of them knew Swedish or had visited Sweden or associated with Swedes in Scotland. The test took place in a language laboratory.

b) 26 beginning students of English at the University of Lund, Sweden. They had studied English for at least 7 years before entering the university. They were all from the province of Skåne and,

with five exceptions, ranged in age from 19 to 26. The test took place in a classroom. These two groups of test subjects received exactly the same instructions as those from London.

Finally, the two test versions were administered to two groups of Swedish schoolchildren:

a) 35 schoolchildren from Malmö, Sweden. They were aged 13-14 and had lived in the Malmö area all their lives. They had studied English at school for 3 to 4 years.

b) 40 schoolchildren from Stockholm (Sollentuna), Sweden. They were aged 13-14 and had spent all their lives in the Stockholm region. They had studied English at school for 3 to 4 years.

Test subjects from Malmö and Stockholm were instructed that they would hear a series of Swedish words pronounced by different native and foreign speakers of Swedish. They were asked to state in each case whether the speaker was a foreigner or a native speaker of Swedish using the following scale:

S = svensk (Swedish)
U = utlänning (foreigner)
? = tveksamt om svensk eller utlänning (doubtful)

They received an answer sheet in Swedish containing only Swedish words; English test words were represented in written form on the answer sheet by the corresponding Swedish test words. The tests in Malmö and Stockholm were administered in a classroom.

3 RESULTS AND DISCUSSION: LONDON INFORMANTS

3.1 OVERALL IDENTIFICATION OF TEST WORDS

In general, test subjects have had little difficulty in distinguishing between Swedish and English test words. This appears clearly from Table 1. These results thus contradict Hök (1972). The number of correct identifications varies, however, depending on the particular test word, as will be shown below.

3.2 IDENTIFICATION OF SWEDISH AND ENGLISH VOWELS

Since Swedish and English vowels were placed in frames of identical consonants (cf. Section 2), we may draw conclusions as to identifications of Swedish and English vowels from the identifications of particular test words. The results are given in Table 2.[2] The information in the table can be taken to indicate a hierarchy of differences between Swedish and English vowels. We shall comment briefly on the most interesting results.

a) The most interesting result is the large number of identifications of S /a/ and E /ʌ/. The number (132) is, in fact, almost identical with the number of correct identifications of E sun (131). We must conclude that the difference in transcription indicates a distinction, which perhaps does not exist.[3] The conclusion is supported by the reactions among Swedish listeners to E /ʌ/ in sun; see Sections 6 and 7.

b) The high number of identifications of S /ɛ/ + /j/ and E /ei/, S /a/ + /j/ and E /ai/ shows that the fricative element in Swedish is too weak to be noticed by a majority of the test subjects. The low identification figure for S /ɔ/ + /j/ should no doubt be attributed to the quality of the vowel /ɔ/. See further the discussion of S mej and E may, S maj and E my in Section 6.

c) The identification figure for S/ɛ/ and E/e/ is surprisingly low. This might be due to the particular test word; notice the high identification of S tenn and E ten referred to in the following section.

d) The long vowels S/i:, u:, o:/ are more often confused with their English counterparts than are the short vowels S/i, u, ɔ/.

e) We find the following hierarchy of differences between Swedish and English short vowels (only the closest Swedish equivalent to an English vowel has been included):

S/a/ and E/ʌ/ — least different
S/ɛ/ and E/e/
S/i/ and E/i/
S/ɔ/ and E/ɔ/
S/u/ and E/u/[4] — most different

It is interesting to observe the relationship between the phonemic symbols for these vowels. The two vowels which are the most similar are usually given different symbols in the transcription of English and Swedish, whereas the same notation is used for the remaining three vowels, which differ considerably.

f) We find the following hierarchy of differences between Swedish and English long vowels (only the closest Swedish equivalent to an English vowel has been included):

S/u:/ and E/u:/ — least different
S/ɑ:/ and E/ɑ:/
S/o:/ and E/ɔ:/
S/i:/ and E/i:/
S/ø:/ and E/ə:/ — most different

These results are, however, preliminary and must be followed up by investigations with a larger number of Swedish model speakers.

3.3 IDENTIFICATION OF SWEDISH AND ENGLISH CONSONANTS IN INITIAL POSITION

The number of identifications of Swedish and English initial consonants has been summarized in Table 3. We shall comment briefly on the results.

a) The high identification of S tenn and E ten, S den and E den is surprising, especially when compared with the low figures for test words containing S/t/ and E/t/, S/d/ and E/d/ in final position (see below). The results seem to indicate that Swedish and English /t, d/ may be perceptually close in initial position. See further the discussion of these consonants in Sections 3.4 and 6.

b) The rather high identification figure for S/j/ in gäss and E/j/ in yes is also noteworthy and should be compared with the figures for S mej and E may, S maj and E my (cf. the preceding section).

c) The low identification figure for S/l/ in lägg and E/l/ in leg must be due to the particular test word, which contains a final /g/; cf. the following section.

d) The very low identification figures for the two pronunciations of S räck and E wreck should probably be attributed to the initial consonant, though the final stop must also have contributed to the low result (cf. the following section). As is to be expected, the identification figure is slightly higher for S[r] than for S[R].

e) The low identification figure for S[ʃ] and E/ʃ/ is no doubt due to the particular test word chock, which differs from E shock in several respects. However, the relationship between the identification figures for S[ʃ], S/ç/ and S[ʂ] is probably correct.

3.4 IDENTIFICATION OF SWEDISH AND ENGLISH FINAL CONSONANTS

The number of identifications of Swedish and English final consonants has been summarized in Table 4. The table only contains examples of final consonants preceded by the short vowels S/ɛ, a/ and E/e, ʌ/, which were found to be perceptually quite close in Section 3.2. The identification figures for test words containing particular final consonants should be compared with the figures for these vowels in test words not containing these consonants. Table 4 includes the most interesting results from our test.

a) The low identification of S bädd and E bed (24.4%), S nätt and E net (12.5%) should be compared with the figures for S den and E den (39.2%), S tenn and E ten (59.1%). This means that word-initial S/t, d/ are frequently taken for English, whereas word-final /t, d/ in Swedish and English are much more rarely confused.[5] Swedish /t, d/ are usually defined as dental stops (see e.g. Malmberg 1966, p. 58, and Stubelius 1968, p. 105), whereas English /t, d/ are described as alveolar stops (see e.g. Gimson 1970, p. 161). However, it appears as if the perceptual effect of this difference in place of articulation may vary depending on the position of the stop in the word. Alternatively, the range of possible variations in place of articulation may be different depending on the position of the consonant in the word. The possibility of a length contrast between final /t, d/ in the Swedish and English test words was investigated, since it is frequently pointed out that a final consonant in Swedish is long when preceded by a short vowel (e.g. Malmberg 1968, p. 120). Stubelius (1968), p. 71 f., says expressly that consonants are

always short in English, whereas they may be long or short in Swedish. Spectrograms were made for test words containing final /t, d/, and the length of the final consonant was measured and related to the length of the sequence of vowel + final consonant.[6] The results are given in Table 5. As appears from the table, there is no length difference in the case of the two test words ending in /t/, whereas the difference is very great for the only test word ending in /d/. The evidence is very scanty and hard to interpret. In order to supplement the material, spectrograms were made of all pronunciations of the test words ending in /t, d/ which were not included in the perceptual experiment, i.e. four pronunciations of each Swedish and English word. The following average C-VC ratios were found:

English /t/ in net, sit 61.4%	Swedish /t/ in nätt, sitt 65.3%
English /d/ in bed 55.5%	Swedish /d/ in bädd 54.1%

On the basis of the evidence given above, it seems reasonable to attribute the low number of identifications of word-final S/t, d/ and E/t, d/ mainly to the difference in place of articulation. The difference in the reactions to word-initial and word-final S/t, d/ is interesting but hard to interpret without further evidence. It is necessary to investigate whether the same result would be found in an examination of a larger material. It should be mentioned that English test words containing word-initial as well as word-final /t, d/ were rarely identified as Swedish by Swedish informants (except when the English words were spoken by the English

informant EF1; cf. the discussion in Sections 3.7, 6 and 7); see the comments on word-initial /t/ in Section 6.

b) The very low identification figures for S bäck and E beck, S ägg and E egg, S lägg and E leg are surprising, since S/k, g/ and E/k, g/ are usually said to be identical in articulation (see e.g. Malmberg 1966, p. 63 f., and Stubelius 1968, p. 110). The possibility of a length contrast was investigated. Spectrograms were made for these test words, and the length of the final stop was measured and related to the length of the sequence vowel + stop. The results are given in Table 6. It appears clearly from the table that there is some difference in length between the English and the corresponding Swedish consonant. As could be expected (cf. Malmberg 1968, p. 120), the relative length of the final stop in the words recorded by speakers from central Sweden (SF2, SM2) is greater than the length of the corresponding consonants when pronounced by southern Swedish speakers (SM1, SF1). However, there is still a difference between the latter and the length of final /k, g/ in the English test words. In order to supplement the material, spectrograms were made of all pronunciations of S bäck, ägg, lägg and E beck, egg, leg which were not included in the perceptual experiment, i.e. four pronunciations of each Swedish and English word. The following average C-VC ratios were found:

English /k/ in beck	Swedish /k/ in bäck
69.9%	71.8%
English /g/ in egg, leg	Swedish /g/ in ägg, lägg
42.3%	56.0%

It appears then as if the greater length contrast

found earlier (see Table 6) between Swedish and English /k/ may have been due to chance. There is some indication that the perceptual difference between S bäck and E beck might be due partly to a difference in the quality of the final consonant. Spectrograms of these test words have been reproduced in Figures 1 and 2. It appears that the noise resulting from the release of the stop is located at a higher frequency level for the Swedish than for the English test word. This would correspond to a more fronted place of articulation in Swedish. It is hard to know whether the same difference would be found in an examination of a larger material. Preliminary studies indicate, however, that the generally accepted view that Swedish and English /k, g/ are identical in place of articulation may turn out to be wrong. This will be investigated in a later study of Swedish and English stops. See further the comments on reactions to E beck, egg, leg among Swedish listeners (Sections 6 and 7).

c) Stubelius (1968) repeatedly draws attention to the fact that there is a length contrast between Swedish and English consonants preceded by a short vowel. The results reported so far indicate that there is far from a consistent length contrast in words ending in stops. The possibility of a length difference was investigated in words containing a final nasal or fricative preceded by a short vowel. Spectrograms were made, and the length of the final consonant was measured and related to the duration of the sequence vowel + consonant. The results are given in Table 7.[7] As can be gathered from the table, the length of final /n/ appears to vary considerably both in Swedish

and English. Similar variation is found in the word ending in /ŋ/. This variability probably explains why test subjects very often identify words like S tenn and E ten, S sann and E sun (see Table 4), although a final nasal tends to be slightly longer in Swedish than in English. The evidence in the case of final /s/ is very slight. In the only test pair ending in /s/ which was included in the perceptual experiment the English word actually contains a relatively longer consonant. This may very well turn out to be due to chance. In any case we have seen that Swedish words ending in a short vowel + final nasal or fricative are frequently taken for English (see Table 4). This, combined with the results of our discussion of final /t, d/ and /k, g/, adds up to the conclusion that the length contrast between Swedish and English final consonants may not always be as marked as has been made out previously.[8] This matter will, however, be examined in a later study.

d) As is to be expected, the identification figure (see Table 4) for final S/l/ in cell and final E/l/ in sell is very low.

e) Finally, it should be pointed out that the identification figure for S[ʈ] in närt and E/t/ in gnat is rather high (36.9%). Cf. the reaction to E gnat among Swedish listeners (Section 6).

3.5 IDENTIFICATION OF NON-MINIMALLY CONTRASTIVE WORDS

Most of the words in the test were designed to examine the perceptual effect of one particular contrast between Swedish and English. However, two pairs included, S sitt and E sit, S mod and E mood, contain sequences of vowel + consonant which were tested individually

in minimally contrastive words. It was hypothesized that the perceptual difference would be greater in these non-minimally contrastive words. This is also clearly borne out by a comparison of the identification figures for S finn, S nätt v. S sitt:

	test points	number of "English" responses
finn	/i/	32
nätt	/t/	22
sitt	/i, t/	2

The same relationship is found between the identification figures for S ho v. S mod:

	test points	number of "English" responses
ho	/u:/	107
mod	/u:, d/	26

3.6 IDENTIFICATION OF SEQUENCES OF MINIMALLY CONTRASTIVE WORDS

The results reported in the preceding section show that there seems to be an additive effect of pronunciation differences. The same conclusion must be drawn from a comparison of the identification figures for the individual words S sann, S mej, S sång v. the figure for the sequence S sann, mej, sång:[9]

	test points	number of "English" responses
sann	/ʌ/	132
mej	/j/	97
sång	/ɔ/	24
sann, mej, sång	/ʌ,j,ɔ/	8

The figures are less clear for S bi, S ho, S så v. the sequence S bi, ho, så, probably because the most deviant test word was placed first in the sequence:

	test points	number of "English" responses
bi	/i:/	40
ho	/u:/	107
så	/ɔ:/	58
bi, ho, så	/i:,u:, ɔ:/	51

In any case, it seems reasonable to conclude that there may be an additive effect of pronunciation differences, though this will have to be substantiated by further evidence. Hence we cannot automatically conclude, as is done in Hök (1972), that a pronunciation difference can be ignored if it passes unnoticed in minimally contrastive words.

3.7 REACTIONS TO TEST WORDS PRONOUNCED BY NATIVE ENGLISH SPEAKERS

As appears from Table 1, test subjects have not consistently been able to correctly identify test words recorded by native English speakers. We shall not comment in detail on the results, since they are mainly of interest from the point of view of English dialectology. Some striking cases of rejection of words pronounced by native English speakers will, however, be pointed out.

Words recorded by the speaker EF1 were often identified as foreign by considerably greater numbers of listeners than the same words pronounced by other speakers. Examples:

Test word	Informant	Number of "foreign" responses (max: 88)
net	EF1	62
	EM2	22
shock 1	EF1	32
	EM2	5
shock 2	EF1	30
	EM2	7

Test word	Informant	Number of "foreign" responses (max:88)
shock 3	EF1	26
	EM2	8
sit	EF1	74
	EM2	23

EF1 has lived in Sweden for a very long time and has a very good command of Swedish, which has probably resulted in slight modification of her English pronunciation. This assumption is supported by the reactions of the groups of Swedish listeners; see Sections 6 and 7.

Other cases of rejection of words pronounced by native English speakers are due to dialectal variation within the English language. The test words sell spoken by EF3 and men, den recorded by EF2 were frequently rejected, probably due to the fact that E/e/ in these words was realized as a very open vowel. A detailed study of the reactions to English test words in a test of this kind could no doubt be an important contribution to English dialectology.

Finally, it should be pointed out that there was rarely completely correct identification of test words recorded by native English speakers. This is to be expected due to the unnaturalness of the testing situation.

4 RESULTS AND DISCUSSION: EDINBURGH INFORMANTS

4.1 OVERALL IDENTIFICATION OF TEST WORDS

On the whole, Edinburgh informants have distinguished very well between Swedish and English test words. Figures for the overall identification of test words are given in Table 8. We may note some differences compared with the figures for the informants from London (see Table 1):

a) The number of "doubtful" responses is higher for Edinburgh informants.

b) The number of "English" responses is higher for Edinburgh informants. This applies both to English and Swedish test words.

These differences might be due to the fact that Edinburgh informants speak a variety of English which is further removed from the English model in the test than the dialect of the London area.[10] Because they are less familiar with the English model, the number of hesitations would naturally be greater. For the same reason, they would more seldom be apt to reject a pronunciation as foreign. In any case, it is interesting to note that the relationship between the number of "English" responses to Swedish and English test words is almost exactly the same for London and Edinburgh informants; see Table 9. It might have been expected that Edinburgh informants would react in the same way to an example of a foreign accent and a native English dialect which is very different from their own. The results from our test show that they can easily distinguish between the two.[11] This may have important consequences for the teaching of pronunciation (cf. Section 9).

4.2 IDENTIFICATION OF INDIVIDUAL VOWELS AND CONSONANTS

The great similarity in overall identification between

London and Edinburgh informants is paralleled by a remarkable consistency in the reactions to individual vowels and consonants. We find almost exactly the same hierarchy of difference between Swedish and English long vowels; see Table 10. The striking contrast between the reactions of the two groups of informants to S gå and E go must be due to the fact that go in Scottish English contains a monophthong similar to the vowel in S gå. In the short vowels there are some important differences; see Table 11. It is interesting to note, however, that the identification figure for S/a/ and E/ʌ/ is very high in both groups of informants. The difference in reactions to S/ʉ/ and S/u/ should no doubt be attributed to the fact that /u/ in Scottish English may differ radically from RP /u/. Gimson (1970), p. 118, states that a centralized [ʉ], presumably close to the rounded, mid, central S/ʉ/, may be used in Scotland.[12] Because of the difference between RP and Scottish English, Edinburgh informants would be less certain of the phonetic norm of English /u/ and would naturally more seldom reject a particular pronunciation as foreign (cf. the general tendency reported in Section 4.1).

Reactions to Swedish consonants differ very little between the two groups of informants; see Tables 12 and 13. The following differences should be noted:

a) The degree of acceptance of S mej and S maj for E may and E my is much lower among Edinburgh informants.

b) The degree of acceptance of S gäss for E yes is slightly lower among Edinburgh informants.

These differences are hard to explain.[13] It should be noted, however, that the reactions to initial and final S/t, d/ vary in the same way in both groups of informants. Similarly, the reactions to final

S/k, g/ are very close. This shows that the interesting perceptual differences between Swedish and English /t, d, k, g/ which we drew attention to in Section 3.4 could not be attributed to chance.

5 RESULTS AND DISCUSSION: LUND INFORMANTS

We shall not report the results of this test in detail. In general, the group of beginning university students turned out to be able to distinguish very well between Swedish and English test words, in certain cases better than the native English informants. This must partly be attributed to the long period they had studied English before entering the university and partly to their familiarity with Swedish. Though they were instructed to listen for English words pronounced by native and foreign speakers of English, it appears as if they started identifying words as either Swedish or English. An important group of words were, however, more often identified as English by Lund informants than by native English informants, i.e. words ending in /t, d, k, g/; see Table 14. The results indicate that the difference between these final stops in Swedish and English must receive more attention in the teaching of English pronunciation to Swedes.

6 RESULTS AND DISCUSSION: MALMÖ INFORMANTS

In this paper we are mainly interested in the reactions of native speakers of English to Swedish test words. Hence, we shall only give a brief account of the tests administered in Malmö and Stockholm, where Swedish informants were asked to identify words as Swedish or foreign.

Informants have had little difficulty in distinguishing between Swedish and English test words. Figures for the overall identification of test words are given in Table 15. According to the table, the per cent of correct identifications is higher among Malmö informants than among informants from London and Edinburgh (see Tables 1 and 8). The per cent of "doubtful" responses is further considerably lower in the former group. The greater accuracy on the part of the Swedish informants should no doubt be attributed to their knowledge of English. Though they were instructed to listen for Swedish words pronounced by native or foreign speakers of Swedish, it appears as if they may have started to identify words as either Swedish or English (cf. Section 5).

We shall compare, in particular, the number of "Swedish" responses to English test words with the number of "English" responses to corresponding Swedish test words among London informants. The following striking similarities should be noted:

a) The great majority of the Swedish informants identified E sun as S sann (82.9%). The number of "English" identifications of S sann among London informants was 75.0%. These results establish beyond doubt that S/a/ and E/ʌ/ are virtually identical.

b) The number of "Swedish" identifications of E egg, leg and beck was low (8.6%, 18.6% and 8.6%). The corresponding figures for "English"

identifications of S ägg, lägg and bäck were: 4.6%, 7.4% and 9.1%. Though the identification figures in two cases of three are slightly higher for the former group, the result further supports the assumption of a difference between S and E/k, g/.

c) Swedish informants frequently identified E yes as S gäss (41.4%). The corresponding figure for "English" identifications of S gäss was 42.1%.

In general, reactions among the two groups of informants were reciprocal, even if the exact identification figures varied. This means that the number of "Swedish" responses to English test words among Swedish informants was generally matched by the number of "English" responses to corresponding Swedish test words among English informants. In a few cases there were, however, important differences between the two groups of informants:

a) Swedish informants frequently identified E puss and S puss (91.4%). The corresponding figure for "English" identifications of S puss was extremely low: 1.7%. The probable reason for this non-reciprocal relationship must be a difference in the range of permissible variations of S/ʉ/ and E/u/. The Swedish vowel /ʉ/ may be realized in the same area as E/u/, but the realizations of E/u/ do not include the normal realization of S/ʉ/.

b) The per cent of "Swedish" identifications of E be and who was very low: 0.0% and 1.4%. However, English informants frequently identified S bi and ho as English: 22.7% and 60.8%. Again, the reason must be a difference in the range of permissible realizations of S/i:, u:/ and E/i:, u:/. S/i:, u:/ are normally characterized by a fricative release. It appears as if E/i:, u:/ may also be realized in this way.[14]

On the other hand, Swedish listeners do not accept the normal realizations of E/i:, u:/ without a fricative release.[15] An indication that this interpretation is correct is the fact that E hoop and mood, with a medial /u:/, were more frequently identified as Swedish than E who: 14.0% and 25.7%. The fricative release of Swedish long, close vowels is less marked in medial position.[16]

c) Swedish informants sometimes identified E may and my with S mej and maj (34.3% and 1.4%). The corresponding figures for "English" identifications of S mej and maj were: 55.1% and 54.6%. Again, it seems as if English listeners are not bothered very much by a fricative release of /ei, ai/, whereas the absence of such a release is liable to be noticed by Swedish listeners. The extremely low acceptance among Swedish informants of E my may be due to the fact that the degree of diphthongization in E/ai/ may be very slight.[17]

d) Swedish informants rarely identified E ten as S tenn (4.3%). The corresponding figure for "English" identifications of S tenn was 59.1%. The probable explanation for this non-reciprocal relationship again seems to be a difference in the range of permissible realizations of initial S/t/ and E/t/. This will be further examined in a later study of Swedish and English stops.

e) Swedish informants from Malmö rarely identified E gnat as S närt (4.3%); the identification figure is almost exactly the same among Stockholm informants (5.0%). The corresponding figure for "English" identifications of S närt was 36.9%.[18]

f) Swedish informants identified E shock more often with S tjock (30.0%) than with S chock (18.6%);

the comparatively high identification figures are due to high acceptances of E shock when pronounced by the speaker EF1 (cf. Section 3.7). On the other hand, English informants more often identified S chock pronounced with [ʃ] as E shock (13.1%) than they identified S tjock as E shock (2.8%). The probable reason for this discrepancy is that the initial phoneme in S chock is realized as [ʂ] by a majority of Swedish speakers.[19] Consequently, there is a tendency to identify [ʃ]-like sounds with /ʂ/.

Finally, an interesting case of correspondence between the reactions of Swedish and English informants should be noted. It was pointed out in Section 3.7 that some English words pronounced by the speaker EF1 were rejected as foreign. This should be compared with the reactions among Swedish informants to these words. The English words shock, net and sit were more frequently identified as Swedish when spoken by EF1 than when recorded by EM2: 37.1% v. 0.0% for the first occurrence of shock, 25.7% v. 5.7% for net, 45.7% v. 0.0% for sit. This supports the assumption made in Section 3.7 that the English pronunciation of EF1 has been modified in some respects due to long residence in Sweden and intimate familiarity with the Swedish language.

7 RESULTS AND DISCUSSION: STOCKHOLM INFORMANTS

The reactions among Stockholm informants do not differ materially from those of the group discussed in the preceding section. Informants had no difficulty in distinguishing between Swedish and English test words, though the per cent of correct identifications was lower than for the Malmö group. In particular, Stockholm informants more frequently identified English words as Swedish (30.6%) than did Malmö informants (19.1%). This may be due to a tendency to confuse English words with Swedish words as pronounced in other dialects.[20]

As regards the matters taken up in the preceding section, there was great agreement, even though the exact figures may differ. It should be noted that the per cent of identifications of Swedish and English words was extremely high in the following cases: E sun and S sann (93.3%), E puss and S puss (91.3%), E yes and S gäss (68.8%). The reactions of the Stockholm and Malmö groups were comparable as regards all the cases of non-reciprocal relationship noted in the preceding section. The two groups were also comparable as regards reactions to the words pronounced by the English speaker EF1; E sit when spoken by EF1 was, for example, identified as Swedish by 77.5% of the Stockholm informants as against an identification figure of 0.0% for the same word spoken by EM2.

It should be noted that the reactions to test words ending in /k, g/ were slightly different in the two groups of Swedish informants. The identification figures for these words were generally higher in the Stockholm group: E leg and S lägg (16.3%), E egg and S ägg (26.3%), E beck and S bäck (32.5%). The corresponding figures for the Malmö group were: 18.6%, 8.6% and 8.6%. This may be a

reflexion of a difference in the range of possible realizations of /k, g/ in the Stockholm and Malmö dialects.

As regards other matters than those discussed in the preceding section, there were sometimes considerable differences between the two groups of Swedish informants. We shall not discuss these matters here, since they are mainly of interest from the point of view of Swedish dialectology.

8 PROBLEMS AND SUGGESTIONS FOR FURTHER RESEARCH

There are some serious shortcomings in our present study. In the first place, the number of recordings of each test word is too small to allow for definite conclusions about the relationship between Swedish and English phonemes. Hence further research is necessary using recordings by a larger number and a larger variety of model speakers.[21] Secondly, the test was only played to a limited number of listener groups. It might be of importance to include a wider variety of listeners representing different ages, dialects and social groups. Thirdly, the test words chosen were sometimes far from perfect. One of the important results of the present study is that test words could be selected in a more objective way. Due to the problems mentioned, the results arrived at are rarely conclusive.[22] They can, however, serve as a basis for interesting hypotheses to be tested in further experiments.

In general, the testing technique has been found to produce interesting, and sometimes rather unexpected, results. If applied on a larger scale, the technique could be an excellent tool not only in establishing the relationship between the phonemes of different languages but also in the description of dialectal variation within one and the same language (cf. Section 3.7). In particular, the method would seem to be useful in establishing the range of realizations of phonemes in different languages or dialects (cf. Section 6).

In studies of the present kind it may be possible to establish a hierarchy of differences between the phonemes of different languages and dialects. It would also be desirable to study evaluative reactions to foreign accents or different accents among native speakers of a language.[23] In this case listeners would be asked not only to state whether a pronuncia-

tion is native-like or not but also to give a rating of the aesthetic or status content of the pronunciation. In the case of foreign accent, it would be of particular interest to establish the degree of irritation of different mispronunciations.[24]

Finally, a word of caution should be added. The present study has used a series of isolated words without a communicative context. This is a necessary limitation of the experimental technique. It may be desirable to find ways of checking the results in more realistic language situations.

9 PRACTICAL APPLICATIONS

We shall briefly consider the relevance of our results to the teaching and testing of English pronunciation. Firstly, the results contribute to a better description of the relationship between Swedish and English phonemes, which is a pre-requisite for efficient teaching. Secondly, the results may furnish information needed in establishing a hierarchy of importance in the teaching and testing of English pronunciation in Sweden. This will be explained below.

This article has mainly been concerned with subphonemic differences between corresponding Swedish and English phonemes. These differences will cause deviations when a Swede speaks English, since, as is well known, a speaker tends to substitute sounds from his native language in a foreign language (interference). It has frequently been argued that subphonemic deviations are of minor importance (e.g. Stubelius 1968, p. 11 ff.). This view is usually supported by two assumptions:

a) Subphonemic deviations are not perceived by native speakers.

b) Subphonemic deviations do not interfere with communication.

Both of these assumptions can be refuted.

The assumption that subphonemic deviations are not noticed by native speakers seems to be supported by the outcome of Hök's (1972) experiment. The opposite view has been argued by Weinreich, Labov and Herzog (1968), p. 130 ff. They conclude:

> "The assumption that perception was determined only by contrastive (morph-distinguishing) units was never based upon a sound empirical foundation, but rather upon a large number of uncontrolled (anecdotal) observations of cases where perception did match phonemic categories. A growing body of evidence from controlled sociolinguistic studies indicates that perception is indeed controlled by linguistic

> structure; but it is a structure which includes not only units defined by contrastive function but also units defined by their stylistic role, and their power to identify the speaker's membership in a specific subgroup of the community ..." (p. 132)

This conclusion is strongly supported by the results of our test. It may also be supported by the commonsense argument that native speakers of a language are extremely sensitive to dialect differences and can often distinguish between several dialects or foreign accents, even though they may not be aware of exactly how these other dialects or foreign accents differ from their own speech.

The assumption that subphonemic deviations do not interfere with communication is based on a very narrow concept of communication. It is true that such deviations cannot change the meaning of a word, but they may have a stylistic significance (cf. the quotation given above from Weinreich, Labov and Herzog 1968). To use the terminology of Karl Bühler (1934), they may be significant as "Ausdruck" or "Appell", though they are irrelevant as "Darstellung". Subphonemic deviations may also affect communication in a much more radical way. Cf. the definition of a speech defect in Van Riper (1947), p. 15:

> "Speech is defective when it deviates so far from the speech of other people that it calls attention to itself, interferes with communication, or causes its possessor to be maladjusted."

As shown by the results of our test, many subphonemic differences between Swedish and English are perceived by almost all native speakers of English who have taken the test. When a Swede substitutes a Swedish sound for an English one, this would be apt to attract the attention of the listener and make him concentrate on the medium rather than the message. In the process communication would be disturbed. Finally, articulatory deviations (phonemic or sub-

phonemic) which the speaker is conscious of may cause him to be maladjusted and inhibit him and thus have serious effects on communication.[25]

The conclusion we must draw is that subphonemic and phonemic deviations should both be considered important. Phonemic deviations will normally affect communication in the sense that they are generally noticed by the listener, even though, due to the redundancy of language, they do not usually cause a complete misunderstanding. On the other hand, the effect of subphonemic deviations could be assumed to vary considerably. In this article we have attempted to establish a scale of the seriousness of subphonemic deviations resulting from the substitution of Swedish sounds for English ones. This scale, which must still be regarded as preliminary, furnishes part of the evidence needed in establishing a hierarchy of importance in the teaching and testing of English pronunciation in Sweden. Other factors which should be taken into account are the frequency and degree of difficulty of English phonemes as well as the existence of variations in pronunciation within the English-speaking community.

NOTES

[1] The recording took place in an echo-free room on a Studer A62 tape-recorder using a Sennheiser MD421 microphone. The recording speed was 7.5 i.p.s.

[2] The information in this and the following tables is based on both test versions, i.e. two pronunciations of each test word. Exact figures are given. However, as these figures may vary due to the choice of test word or due to the model speakers who have recorded the word, they are only to be taken as rough approximations. Exact figures in a test of this kind are less interesting than relationships.

[3] The result supports Stubelius (1968), who introduced the transcription /a/ instead of /ʌ/ for the vowel in E sun.

[4] The very low identification figure for S/u/ and E/u/ may be due to the choice of test words, S koks and E cooks, which contain /k/; cf. Section 3.4.

[5] It should perhaps be pointed out that the recordings of S tenn, nätt, den, bädd were selected from the same model speakers. Hence the difference in reaction among listeners to S tenn v. nätt, den v. bädd could not be attributed to the choice of speaker.

[6] The principles of segmentation outlined in Elert (1964), p. 82 ff., were followed. This applies to all length measurements reported.

[7] In the case of S gäss and E yes the figure in the table indicates the relative length of the final consonant with relationship to the whole word.

[8] Note, however, that Jonasson and McAllister, in their recent study (1972), have found a length difference in medial /p/ when pronounced in nonsense words by Swedish and American English speakers.

[9] The series were recorded with a falling intonation on each word, not with list intonation.

[10] The disagreement could possibly also be due to the age difference between Edinburgh and London informants; cf. Section 2.

[11] It should be kept in mind, however, that the dialect of the English speakers (RP) is especially well known. In any case, it is interesting to note that the reactions of the two groups of listeners are comparable as regards such details as the rejection of several test words spoken by the English informant EF1 (cf. Section 3.7) or the uncertainty about E sell when spoken by EF3 (cf. Section 3.7).

[12] Cf. also Catford (1958), p. 111.

[13] The rejection of S mej for E may must partially be due to the well-known fact that may in Scottish English contains a monophthong.

[14] Cf. Gimson (1970), pp. 99 and 119, where it is stated that RP /i:/ and /u:/ are rarely pure vowels. The diphthongization is, however, normally different in English and Swedish: Swedish [ij], [uw] v. English [Ii], [Uu].

[15] Cf. Hammarström and Norman (1957), p. 97: "It is also of interest that foreigners who learn Swedish generally have to learn consciously the fricative releases in question. If they do not succeed, their pronunciation sounds markedly un-Swedish." (in translation).

[16] Cf. Elert (1966), p. 37.

[17] Cf. Gimson (1970), p. 130, "... the tongue is not usually raised to a level closer than C [ë];"

[18] In the last four cases of non-reciprocal reaction there was a higher degree of acceptance among English than among Swedish listeners. It might be suggested that this is due to a tendency among English listeners

to accept deviant pronunciations as English. This explanation is, however, not supported by the figures for the overall identification of test words (cf. Tables 1 and 15).

[19] Cf. Malmberg (1968), p. 96.

[20] This may be illustrated by the following example. Stockholm informants more often identified E go and S gå (48.8%) than did Malmö informants (4.3%), although diphthongization of S /o:/ occurs in the Malmö dialect but not in the variety of Swedish spoken in the Stockholm area.

[21] In a study very similar to the present one Kitzing (1972) has demonstrated that local dialects must be taken into account in contrastive analysis. A particular problem in our study is that different test words were selected from different speakers. This was a necessary limitation in order to preclude identification of test words by reference to voice quality.

[22] For the same reason it has not been considered necessary, or even desirable, to comment in detail on all our tests. Notice, however, that the results were often remarkably consistent, e.g. the responses of the two groups of English listeners (cf. Section 4) and those of the Malmö and Stockholm groups of Swedish listeners (cf. Section 7) or the reactions of both Swedish and English listeners to words pronounced by the speaker EF1 (cf. Sections 3.7, 6 and 7). There was further a consistent reaction to words which occur more than once in the test (E shock, wreck and gnat). The exact figures may vary slightly, but, as pointed out above (note [2]), exact figures are less interesting than relationships. Finally, there appears to be no appreciable sign of learning effect or fatigue among the two groups of English listeners, which are of particular interest; cf. the

identification figures for Tests I and II in Tables 1 and 8.

[23] Cf. e.g. the studies by Giles (1970, 1971a, 1971b).

[24] We do not want to suggest that foreign accent could be investigated exhaustively by the technique used in this paper, i.e. by mixing similar sounding words in the native and the foreign language. Actual realizations of words spoken by learners in the foreign language will obviously have to be included, since it is well known that features of foreign accent may not be attributed to interference from the native language (cf. F.A. Johansson 1973). A good example is given in Jonasson and McAllister (1972), p. 15 f.

[25] For a discussion of the communicative effects of foreign accent, see further Chreist (1964), p. XIV ff.

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Table 1. Overall identification of test words. London informants.

Test words \ Response	English	Foreign	Doubtful
Swedish Test I	733 (20.8%)	2599 (73.8%)	188 (5.3%)
Test II	796 (22.6%)	2548 (72.4%)	176 (5.0%)
Total	1529 (21.7%)	5147 (73.1%)	364 (5.2%)
English Test I	2584 (73.4%)	732 (20.8%)	204 (5.8%)
Test II	2632 (74.8%)	699 (19.9%)	189 (5.4%)
Total	5216 (74.1%)	1431 (20.3%)	393 (5.6%)

Table 2. Identifications of Swedish and English vowels. London informants.

Swedish vowel	English vowel	Test words		Identifications (Maximum: 176)
		Swedish	English	
/a/	/ʌ/	sann	sun	132 (75.0%)
/u:/	/u:/	ho	who	107 (60.8%)
/ɛ/ + /j/	/ei/	mej	may	97 (55.1%)
/a/ + /j/	/ai/	maj	my	96 (54.6%)
/ɑ:/	/ɑ:/	fas	farce	79 (44.9%)
/ɛ/	/e/	män	men	72 (40.9%)
/o:/	/ɔ:/	så	saw	58 (33.0%)
/i:/	/i:/	bi	bee	40 (22.7%)
/o:/	/əu/	gå	go	33 (18.8%)
/i/	/i/	finn	fin	32 (18.2%)
/ɛ/	/æ/	män	man	29 (16.5%)
/ɔ/ + /j/	/ɔi/	boj	boy	25 (14.2%)
/ɔ/	/ɔ/	sång	song	24 (13.6%)
/ø:/	/ə:/	hö	her	18 (10.2%)
/u/	/u/	koks	cooks	13 (7.4%)
/e:/	/ei/	be	bay	7 (4.0%)
/ŭ/	/u/	puss	puss	3 (1.7%)
/œ/	/ʌ/	söm	sum	1 (0.6%)

Table 3. Identifications of Swedish and English initial consonants. London informants.

Swedish consonant	English consonant	Test words		Identifications (Maximum: 176)
		Swedish	English	
/t/	/t/	tenn	ten	104 (59.1%)
/j/	/j/	gäss	yes	74 (42.1%)
/d/	/d/	den	den	69 (39.2%)
[ʃ]	/ʃ/	chock	shock	23 (13.1%)
/l/	/l/	lägg	leg	13 (7.4%)
[r]	/r/	räck	wreck	8 (4.6%)
/ç/	/ʃ/	tjock	shock	5 (2.8%)
[R]	/r/	räck	wreck	1 (0.6%)
[ʂ]	/ʃ/	chock	shock	0 (0.0%)

Table 4. Identifications of Swedish and English final consonants. London informants.

Swedish consonant	English equivalent	Test words		Identifications (Maximum: 176)
		Swedish	English	
/n/	/n/	sann	sun	132 (75.0%)
		tenn	ten	104 (59.1%)
/j/	/ei/	mej	may	97 (55.1%)
	/ai/	maj	my	96 (54.6%)
/s/	/s/	gäss	yes	74 (42.1%)
/d/	/d/	bädd	bed	43 (24.4%)
/t/	/t/	nätt	net	22 (12.5%)
/k/	/k/	bäck	beck	16 (9.1%)
/l/	/l/	cell	sell	10 (5.7%)
/g/	/g/	lägg	leg	13 (7.4%)
		ägg	egg	8 (4.6%)

Table 5. The length of final /t, d/ (C) expressed in per cent of the duration of the sequence vowel + consonant (VC)

English test word	Informant	C-VC ratio		Swedish test word	Informant	C-VC ratio	
net	EF1	77.8%		nätt	SF2	72.0%	
	EM2	75.0%	Average:		SM1	64.0%	Average:
sit	EF1	81.7%	78.4%	sitt	SF2	79.7%	75.1%
	EM2	79.0%			SM1	84.5%	
bed	EM1	27.8%	Average:	bädd	SM1	51.8%	Average:
	EF2	29.9%	28.9%		SF2	68.8%	60.3%

Table 6. The length of final /k, g/ (C) expressed in per cent of the duration of the sequence vowel + consonant (VC)

English test word	Informant	C-VC ratio		Swedish test word	Informant	C-VC ratio	
leg	EM3	46.3%		lägg	SM2	66.1%	
	EF3	46.3%	Average:		SF1	58.3%	Average:
egg	EM3	45.6%	47.5%	ägg	SM2	61.0%	60.3%
	EF?	51.8%			SF1	55.9%	
beck	EF?	58.9%	Average:	bäck	SF2	73.3%	Average:
	EM1	62.1%	60.5%		SM1	69.6%	71.5%

Table 7. The length of final nasals and fricatives (C) expressed in per cent of the duration of the sequence of vowel + consonant (VC)

English test word	Informant	C-VC ratio		Swedish test word	Informant	C-VC ratio	
ten	EF1	64.6%		tenn	SF2	75.3%	
	EM2	69.8%			SM1	64.2%	
den	EM1	55.4%		den	SF2	72.7%	
	EF2	48.3%			SM1	79.0%	
fin	EF3	75.4%	Average:	finn	SF3	80.0%	Average:
	EM3	63.6%	59.7%		SM3	55.8%	66.5%
sun	EM1	64.0%		sann	SM1	55.9%	
	EF2	50.0%			SF2	60.8%	
men	EM1	54.7%		män	SF3	65.1%	
	EF2	51.2%			SM3	56.6%	
song	EM1	48.3%	Average:	sång	SF2	64.6%	Average:
	EF2	62.8%	55.5%		SM1	52.4%	61.5%
yes	EF1	59.3%	Average:	gäss	SF3	52.2%	Average:
	EM2	53.9%	56.6%		SM3	49.2%	50.7%

Table 8. Overall identification of test words. Edinburgh informants.

Test words \ Response	English	Foreign	Doubtful
Swedish Test I	284 (28.4%)	634 (63.4%)	82 (8.2%)
Test II	266 (26.6%)	638 (63.8%)	96 (9.6%)
Total	550 (27.5%)	1272 (63.6%)	178 (8.9%)
English Test I	792 (79.2%)	129 (12.9%)	79 (7.9%)
Test II	793 (79.3%)	122 (12.2%)	85 (8.5%)
Total	1585 (79.3%)	251 (12.6%)	164 (8.2%)

Table 9. Per cent of "English" responses among London and Edinburgh informants.

Test words	London informants	Edinburgh informants
English	74.1%	79.3%
Swedish	21.7%	27.5%
Difference	52.4%	51.8%

Table 10. Identification of Swedish and English long vowels among London and Edinburgh informants.

Swedish vowel and test word	English vowel and test word	Per cent identifications	
		London informants	Edinburgh informants
/u:/ ho	/u:/ who	60.8%	75.0%
/ɑ:/ fas	/ɑ:/ farce	44.9%	59.6%
/o:/ så	/ɔ:/ saw	33.0%	51.9%
/i:/ bi	/i:/ bee	22.7%	26.9%
/o:/ gå	/əu/ go	18.8%	67.3%
/ø:/ hö	/ə:/ her	10.2%	17.3%
/e:/ be	/ei/ bay	4.0%	9.6%

Table 11. Identifications of Swedish and English short vowels among London and Edinburgh informants.

Swedish vowel and test word	English vowel and test word	Per cent identifications	
		London informants	Edinburgh informants
/a/ sann	/ʌ/ sun	75.0%	82.7%
/ɛ/ män	/e/ men	40.9%	42.3%
/i/ finn	/i/ fin	18.2%	17.3%
/ɛ/ män	/æ/ man	16.5%	14.0%
/ɔ/ sång	/ɔ/ song	13.6%	17.3%
/u/ koks	/u/ cooks	7.4%	59.6%
/ʉ/ puss	/u/ puss	1.7%	50.0%
/œ/ söm	/ʌ/ some	0.6%	0.0%

Table 12. Identifications of Swedish and English initial consonants among London and Edinburgh informants.

Swedish consonant and test word	English consonant and test word	Per cent identifications	
		London informants	Edinburgh informants
/t/ tenn	/t/ ten	59.1%	71.2%
/j/ gäss	/j/ yes	42.1%	40.4%
/d/ den	/d/ den	39.2%	51.9%
[ʃ] chock	/ʃ/ shock	13.1%	1.9%
/l/ lägg	/l/ leg	7.4%	1.9%
[r] räck	/r/ wreck	4.6%	5.8%
/ç/ tjock	/ʃ/ shock	2.9%	1.9%
[R] räck	/r/ wreck	0.6%	5.8%
[ʂ] chock	/ʃ/ shock	0.0%	0.0%

Table 13. Identifications of Swedish and English final consonants among London and Edinburgh informants.

Swedish consonant and test word	English equivalent and test word	Per cent identifications	
		London informants	Edinburgh informants
/n/ sann	/n/ sun	75.0%	82.7%
tenn	ten	59.1%	71.2%
/j/ mej	/ei/ may	55.1%	5.8%
maj	/ai/ my	54.6%	15.4%
/s/ gäss	/s/ yes	42.1%	40.4%
/d/ bädd	/d/ bed	24.4%	28.9%
/t/ nätt	/t/ net	12.5%	3.9%
/k/ bäck	/k/ beck	9.1%	7.7%
/l/ cell	/l/ sell	5.7%	1.9%
/g/ lägg	/g/ leg	7.4%	9.6%
ägg	egg	4.6%	9.6%

Table 14. A comparison of the reactions to some Swedish test words ending in /t, d, k, g/ among Lund, London and Edinburgh informants.

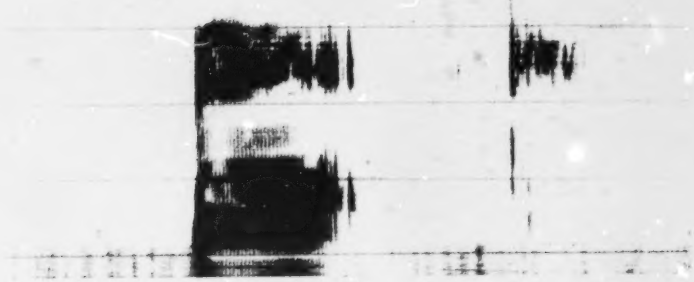
Swedish test word	Per cent "English" responses		
	Lund informants	London informants	Edinburgh informants
nätt	30.8%	12.5%	3.9%
bädd	46.2%	24.4%	28.9%
bäck	32.7%	9.1%	7.7%
ägg	36.5%	4.6%	9.6%
lägg	26.9%	7.4%	9.6%
chock	36.5%	13.1%	1.9%
Average	34.9%	11.8%	10.3%

Table 15. Overall identification of test words. Malmö informants.

Test words \ Response	Foreign	Swedish	Doubtful
Swedish Test I	285 (20.4%)	1085 (77.5%)	30 (2.1%)
Test II	198 (14.1%)	1166 (83.3%)	36 (2.6%)
Total	483 (17.3%)	2251 (80.4%)	66 (2.4%)
English Test I	1076 (76.9%)	301 (21.5%)	23 (1.6%)
Test II	1139 (81.4%)	235 (16.8%)	26 (1.9%)
Total	2215 (79.1%)	536 (19.1%)	49 (1.8%)

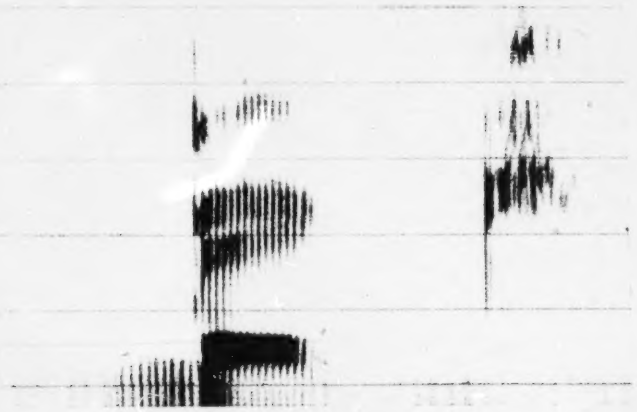
Fig. 1 Wide band spectrograms of English test word <u>beck</u> pronounced by informants EM1 and EF2. Frequency scale is indicated by horizontal lines separated by 1000 Hz.

EM1: beck

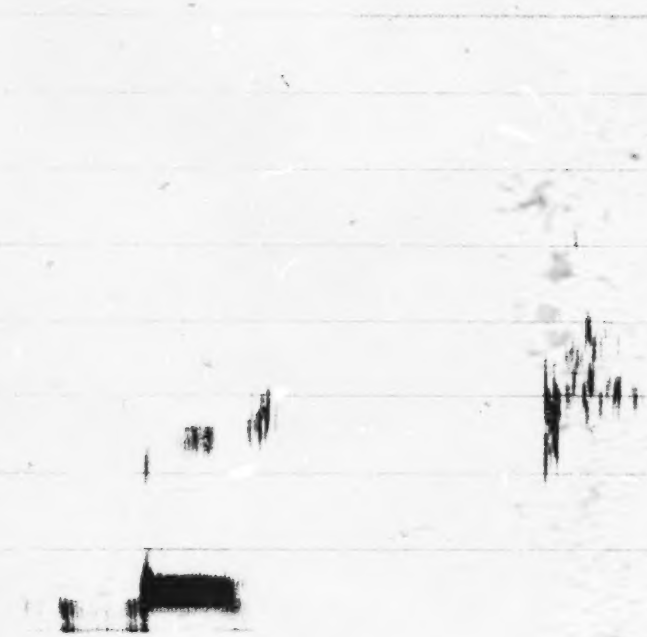


EF2: beck

Fig. 2 Wide band spectrograms of Swedish test word bäck pronounced by informants SM1 and SF2. Frequency scale is indicated by horizontal lines separated by 1000 Hz.



SM1: bäck



SF2: bäck

APPENDIX 1: Swedish-English word pairs

	English:	Swedish:
1	bee /bi:/	bi /bi:/
2	fin /fin/	finn /fin/
3	men /men/	män /mɛn/
4	man /mæn/	män /mɛn/
5	who /hu:/	ho /hu:/
6	cooks /kuks/	koks (pass. av koka)/kuk
7	puss /pus/	puss /pŭs/
8	saw /sɔ:/	så /so:/
9	song /sɔŋ/	sång /sɔŋ/
10	her /hə:/	hö /hø:/
11	farce /fɑ:s/	fas /fɑ:s/
12	sun /sʌn/	sann /san/
13	sum /sʌm/	söm /sœm/
14	may /mei/	mej /mɛj/
15	bay /bei/	be /be:/
16	my /mai/	maj /maj/
17	boy /bɔi/	boj /bɔj/
18	go /gəu/	gå /go:/
19	hoop /hu:p/	hop /hu:p/
20	sauce /sɔ:s/	sås /so:s/
21	ten /ten/	tenn /tɛn/
22	net /net/	nätt /nɛt/
23	gnat /næt/	nät /nɛ:t/
24	gnat /næt/	närt [næ:ʈ]
25	den /den/	den /dɛn/
26	bed /bed/	bädd /bɛd/
27	wreck /rek/	räck [ræk]
28	wreck /rek/	räck [Ræk]
29	leg /leg/	lägg /lɛg/
30	sell /sel/	cell /sɛl/
31	yes /jes/	gäss /jɛs/
32	shock /ʃɔk/	tjock /ɕɔk/

33	shock /ʃɔk/	chock [ʃɔk]
34	shock /ʃɔk/	chock [ʃɔk]
35	beck /bek/	bäck /bɛk/
36	egg /eg/	ägg /ɛg/
37	sit /sit/	sitt /sit/
38	mood /mu:d/	mod /mu:d/
39	bee, who, saw /bi:, hu:, sɔ:/	bi, ho, så /bi:, hu:, so:/
40	sun, may, song /sʌn, mei, sɔŋ/	sann, mej, sång /san, mɛj, sɔŋ/

Note: Broad transcription has been used, except in the case of S närt, chock and räck. The Swedish transcription follows Malmberg, Svensk fonetik (Lund: Gleerups, 4th ed. 1968). The English transcription follows Everyman's English Pronouncing Dictionary (London: Dents Ltd., 13th ed. 1967).

APPENDIX 2: The test

SM1 = Swedish male informant (southern standard Swedish
SM2 = " " " (central " "
SM3 = " " " (southern " "
SF1 = " female " (" " "
SF2 = " " " (central " "
SF3 = " " " (southern " "
EM1, EM2, EM3 = English male informants.
EF1, EF2, EF3 = English female informants.

Test item	Test I	Test II	Test item	Test I	Test II
1 E gnat	EF3	EM3	21 S maj	SF1	SM1
2 S bi	SM2	SF1	22 S koks	SF3	SM3
3 S räck[r]	SF2	SM2	23 S räck[R]	SM1	SF1
4 E shock	EF1	EM2	24 E men	EM1	EF2
5 E may	EF2	EM1	25 S sann	SF2	SM1
6 S cell	SM3	SF3	26 E sit	EF1	EM2
7 E wreck	EM1	EF2	27 S be	SM3	SF3
8 S puss	SF3	SM3	28 E bee,who,saw	EM2	EF1
9 S nätt	SM1	SF2	29 S mod	SF1	SM2
10 S chock[ʃ]	SF2	SM2	30 E egg	EM3	EF3
11 E cooks	EF2	EM1	31 S chock[ʂ]	SF3	SM3
12 E fin	EM3	EF3	32 S närt	SM2	SF2
13 S mej	SF2	SM1	33 S boj	SF2	SM1
14 E leg	EF3	EM3	34 E bay	EF3	EM3
15 E puss	EF1	EM2	35 S bi,ho,så	SM2	SF1
16 S hö	SM3	SF3	36 E song	EF2	EM1
17 S bädd	SM1	SF2	37 E sum	EM3	EF3
18 E beck	EM1	EF2	38 E saw	EM2	EF1
19 E net	EF1	EM2	39 S män	SM3	SF3
20 E yes	EM2	EF1	40 E boy	EF2	EM1

Test item	Test I	Test II	Test item	Test I	Tes II
41 S hop	SM2	SF1	61 E sell	EF3	EM3
42 E farce	EM3	EF3	62 S lägg	SF1	SM2
43 S tjock	SF1	SM2	63 E mood	EM3	EF3
44 S sann,maj,sång	SF2	SM1	64 E go	EM1	EF2
45 E den	EM1	EF2	65 S män	SM3	SF3
46 E shock	EF1	EM2	66 S gäss	SF3	SM3
47 E who	EM2	EF1	67 S den	SM1	SF2
48 E man	EF2	EM1	68 E her	EF3	EM3
49 S sitt	SM1	SF2	69 S så	SM2	SF1
50 S nät	SF1	SM2	70 S söm	SF3	SM1
51 E my	EM3	EF3	71 E ten	EF1	EM2
52 S ho	SM2	SF1	72 E hoop	EM2	EF1
53 E sauce	EM2	EF1	73 E sun,may,song	EF2	EM1
54 S gå	SF3	SM3	74 S fas	SF3	SM3
55 S finn	SM3	SF3	75 E shock	EF1	EM2
56 E sun	EF2	EM1	76 S tenn	SM1	SF2
57 S bäck	SM1	SF2	77 S sång	SF2	SM1
58 E bee	EM2	EF1	78 E gnat	EF3	EM3
59 E bed	EM1	EF2	79 E wreck	EM1	EF2
60 S sås	SM2	SF1	80 S ägg	SF1	SM2

SWEDISH-ENGLISH CONTRASTIVE STUDIES

Department of English, Lund University

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